CANADA

THE EARLY POST-GRADUATE YEARS IN THE TECHNICAL AND SCIENTIFIC PROFESSIONS IN CANADA

a case study of the 1954 graduating class of engineers and scientists

A professional manpower bulletin

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DEPARTMENT OF LABOUR
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Professional Manpower Bulletin No. 6

ECONOMICS AND RESEARCH BRANCH
DEPARTMENT OF LABOUR
Ottawa, April 1959

Hon. Michael Starr
Minister

A.H. Brown
Deputy Minister

FOREWORD

This report was prepared in the Manpower Resources Division of the Economics and Research Branch of the Department of Labour by Mr. R.B. Irvine and Mr. P.R. Schweitzer under the supervision of Mr. P.H. Casselman and the general direction of Mr. J.P. Francis. Mrs. D.C. French edited the manuscript and prepared it for publication.

The assistance of the graduates and others who furnished information requisite for this survey is gratefully acknowledged.

W.R. Dymond,
Director,
Economics and Research Branch,
Department of Labour.

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Table 1 – The Graduating Classes in Engineering and Natural Sciences 1954: Universities by Scholastic Specialization

UNIVERSITY FROM WHICH DEGREE OBTAINED	MAJOR COURSE																							
	Aeronautical Engineering	Chemical Engineering	Civil Engineering	Electrical Engineering	Engineering and Business	Engineering Physics	Forest Engineering and Forestry	Geological Engineering	Metallurgical Engineering	Mechanical Engineering	Mining Engineering	Petroleum Engineering	Architecture	Agriculture	Biochemistry and Physiology	Biology	Chemistry	General Science	Geography	Geology	Mathematics and Physics	Veterinary Medicine	Total Number Responding	Total 1954 Graduates
Acadia University	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	19	–	–	–	–	21	24
University of Alberta	–	15	26	11	–	–	–	1	–	–	1	10	–	16	–	–	2	29	–	2	5	–	118	163
Ecole des Beaux-Arts de Montréal	–	–	–	–	–	–	–	–	–	–	–	–	7	–	–	–	–	–	–	–	–	–	7	11
Bishop's University	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10	–	–	2	–	12	13
University of British Columbia	–	6	15	21	–	7	13	5	2	17	2	–	6	29	–	4	7	47	–	3	6	–	190	281
Carleton University	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	1	–	–	–	–	3	3
Dalhousie University	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	13	–	–	1	–	16	25
L'Université Laval	–	5	13	10	–	–	14	3	3	–	–	–	–	9	–	2	2	–	–	–	4	–	65	86
University of Manitoba	–	–	16	14	–	1	–	2	–	16	–	–	22	15	–	1	6	40	–	3	3	–	139	183
MacDonald College	–	–	–	–	–	–	–	–	–	–	–	–	–	25	–	–	–	–	–	–	–	–	25)	302
McGill University	–	11	22	26	–	6	–	–	4	39	6	–	11	–	6	2	4	27	–	2	2	–	168)	
McMaster University	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	7	14	3	5	9	–	42	53
Ecole de Médecine Vétérinaire	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7	7	–
Université de Montréal	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	4	3	–	–	8	–	16	–
Mount Allison University	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	1	–	–	1	–	4	5
University of New Brunswick	–	–	16	7	–	–	20	–	–	6	–	–	–	–	–	–	4	1	–	1	–	–	55	69
Nova Scotia Technical College	–	6	18	11	–	–	–	–	2	14	2	–	–	–	–	–	–	–	–	–	–	–	53	65
Institut Agricole d'Oka	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	1	–	–	1	–	4	5
Ontario Agricultural College	–	–	–	–	–	–	–	–	–	–	–	–	–	52	–	–	–	–	–	–	–	–	52	66
Ontario Veterinary College	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	43	43	72
Université d'Ottawa	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1	1
Ecole Polytechnique	–	1	17	14	–	–	–	3	1	–	–	–	–	–	–	–	–	–	–	–	–	–	36	119
Queen's University	–	21	29	20	–	3	–	3	5	28	10	–	–	–	3	5	5	5	–	–	6	–	143	183
St. Francis Xavier University	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	2	3
University of Saskatchewan	–	8	17	1	–	1	–	7	–	14	–	–	–	24	–	1	2	2	–	1	3	–	81	102
Sir George Williams College	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	45	–	–	–	–	45	68
Toronto University	1	43	36	32	28	10	32	3	3	43	2	–	17	–	8	1	4	–	5	4	18	–	290	384
University of Western Ontario	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	6	4	1	4	4	–	25	32
United States	–	–	3	–	–	–	–	–	–	3	–	–	1	–	–	–	–	–	–	–	1	–	8)	
United Kingdom	–	2	3	1	–	–	–	–	–	1	–	–	–	1	–	–	1	1	–	–	5	–	15)	73
Other Foreign	–	1	5	1	–	–	–	–	2	3	–	–	–	1	–	–	2	–	–	–	2	–	17)	
Total Number Responding	1	119	236	169	28	28	79	27	22	184	23	10	64	179	17	30	62	264	9	25	80	50	1706[2]	
Total 1954 Graduates	2	163	347	235	35	40	104	33	31	286	35	12	92	233	(1)	42	111	341	12	32	108	92		2386

(1) Included with Chemistry

(2) 1616 male; 90 female

INTRODUCTION

The information presented in this report is based on a questionnaire survey of the 1954 graduating class of engineers and scientists from Canadian universities and colleges. Questionnaires were completed by the new graduates a few months prior to graduation in 1954 and again three years later, in 1957. From a total of 2,386 inquiry forms mailed out in 1957, 1,706 were returned – a rate of return of 71½ per cent. These returns were paired with the corresponding returns for 1954 and comparisons were made. Where corresponding returns for 1954 were not available, "provisional" * questionnaires, containing only such fundamental data as name, address, university and course, were used.

The principal purpose of this report is to throw some light on the careers followed by this group of university graduates in the engineering and science fields during the three years immediately after they obtained their undergraduate degree. The report sketches these careers in terms of the type of industry in which employment was obtained, the kind of functions performed, the field of specialization, the geographic location of the job, and the extent of post-graduate study.

It should be remembered when using the data in this report that they are limited by the lack of complete survey returns, and by possible misunderstanding of some questions by some respondents. It is quite possible that information on the 680 graduates not replying or not reached could alter some of the findings summarized in this report. These 680 graduates consisted of 375 who did not reply, 304 who had moved to an unknown destination, and one who was deceased.

The findings, it is hoped, will indicate to what degree and how rapidly young professionals are absorbed into employment for which their academic training is intended to prepare and qualify them. They will also provide some impression of their income and geographic mobility in this first and important stage of their professional careers. The analysis may suggest further profitable research in the same field and may raise some significant questions that cannot be answered within the scope of this report.

The period under consideration (1954–1957) was characterized by a steady increase in the Canadian economy's demand for engineers and scientists, with corresponding shortages. ** The employment experience of the 1954 graduates, as shown in this report, undoubtedly reflects this favourable demand situation, inasmuch as some sectors of the economy were able to attract young graduates and influence their decision either to the labour force or to undertake post-graduate study.

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* The information on these "provisional" questionnaires was gathered principally from class lists and university registration offices.

** *Professional and Skilled Manpower in Canada,* submission of the Economics and Research Branch, Department of Labour, Ottawa, Ontario, 1957, to the *Royal Commission on Canada's Economic Prospects, Chart V, p. 31,* The Queen's Printer.

Table 1 presents data relating to scholastic specialization and university of that portion of the graduating class of 1954 that responded to the survey. This constitutes the sample upon which the present analysis is based.

An attempt will be made to trace the history of the class in the three years following graduation, and to compare, contrast, and explain their positions in 1954 and 1957.

THE EMPLOYMENT STATUS OF 1954 ENGINEEERING AND SCIENCE GRADUATES IN 1957

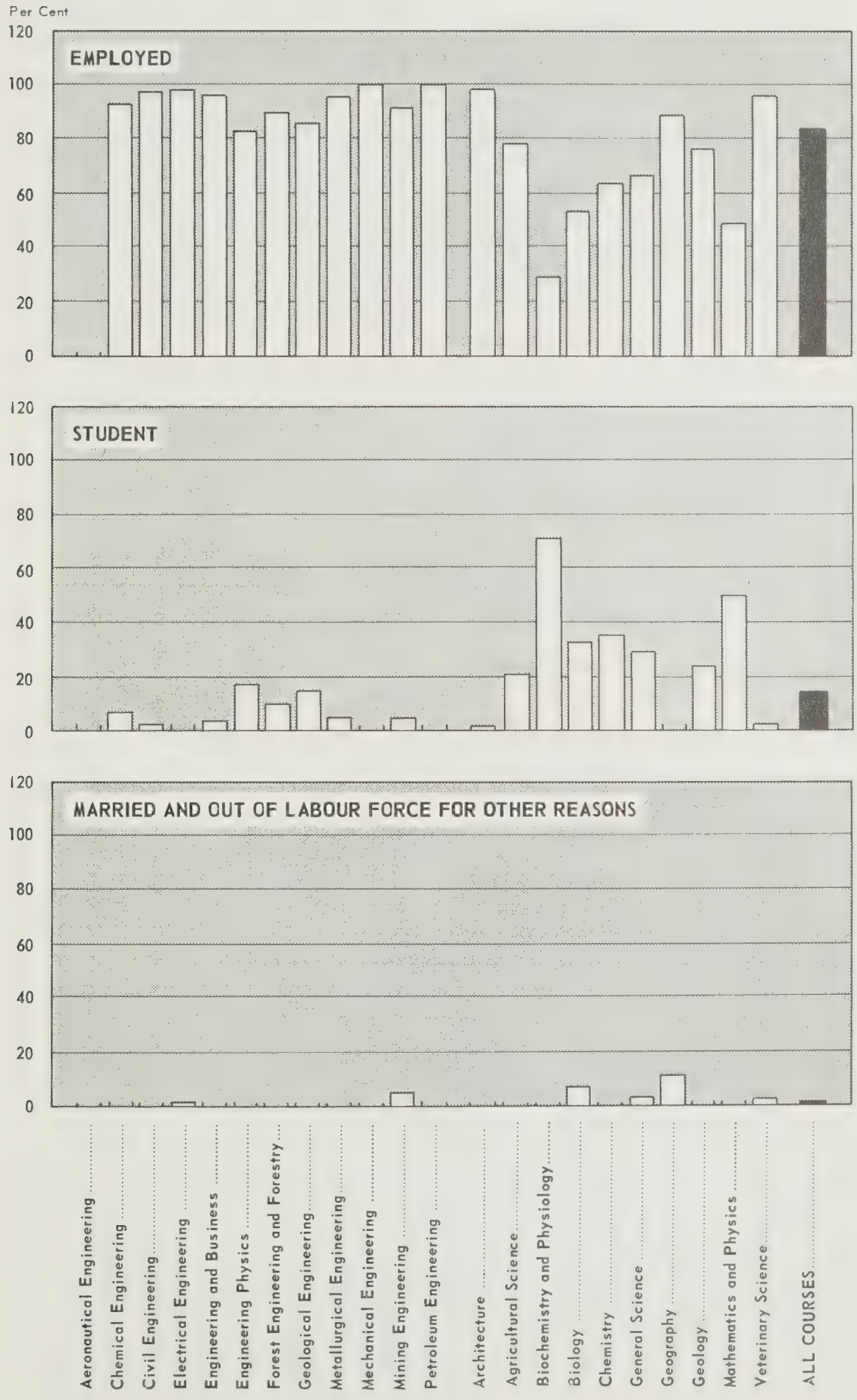


Table 2 – 1954 Graduates: Field of Scholastic Specialization in 1954 by Employment Status in 1957
(Percentage Distribution)

EMPLOYMENT STATUS	FIELD OF SPECIALIZATION IN 1954																					
	Aeronautical Engineering	Chemical Engineering	Civil Engineering	Electrical Engineering	Engineering and Business	Engineering Physics	Forest Engineering and Forestry	Geological Engineering	Metallurgical Engineering	Mechanical Engineering	Mining Engineering	Petroleum Engineering	Architecture	Agricultural Science	Biochemistry and Physiology	Biology	Chemistry	General Science	Geography	Geology	Mathematics and Physics	Veterinary Medicine	All Courses
Employed Full Time	–	93.3	97.1	97.0	96.4	82.1	88.6	81.5	95.5	100.0	87.1	100.0	98.4	75.4	29.4	43.5	62.9	65.0	77.8	76.0	48.7	96.0	83.2
Employed Part Time	–	–	.8	1.2	–	–	1.3	3.7	–	–	4.3	–	–	2.8	–	10.0	–	.5	11.1	–	–	–	1.1
Unemployed	–	–	–	.6	–	–	–	–	–	–	–	–	–	1.7	–	6.6	1.6	2.7	–	–	1.3	–	0.9
Student	100.0	6.7	2.1	–	3.6	17.9	10.1	14.8	4.5	–	4.3	–	1.6	20.1	70.6	33.3	35.5	29.5	–	24.0	50.0	2.0	14.1
Retired and Other	–	–	–	1.2	–	–	–	–	–	–	4.3	–	–	–	–	6.6	–	2.3	11.1	–	–	2.0	0.7
Percentage	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Persons Representing Percentages	1	119	236	169	28	28	79	27	22	184	23	10	64	179	17	30	62	264	9	25	80	50	1706

Chapter I – EMPLOYMENT

THE EMPLOYMENT PICTURE. . .

What was the employment status of the 1954 graduates three years later, in 1957?

Table 2 indicates that by 1957 almost four-fifths of the respondents were employed full-time at jobs requiring a technical and scientific background. Such employment was notably higher among engineers than among scientists. In all fields of engineering, well over three-quarters of the graduates had found full-time professional employment, with the single exception of mining engineering where non-technical, non-scientific employment (in most cases supervisory positions are indicated) was high.

The major reason for a lower employment rate among the scientists was that a great many had pursued post-graduate studies which were not completed in time for them to enter the labour market in 1957. A considerably smaller proportion of the engineers were still students. Taking all the graduates together, 14 per cent held student status in 1957.

The unemployment level, while somewhat higher for scientists than for engineers, was, in the aggregate, very low. Less than 1 per cent of the respondents were out of jobs and seeking work.

Approximately 5 per cent of the graduates had acquired non-scientific, non-technical jobs.

The distinction between professional and non-technical and non-scientific employment was made by the respondents themselves. Such a distinction is to a great degree subjective and arbitrary since there are no generally accepted objective criteria. Many positions lie on the borderline (such as technical sales, various supervisory and administrtive positions, technical writing and purchasing, to name but a few) because although they may require a certain level of technical competency it is of a rather restricted nature. Such positions can be classified as either technical or non-technical depending on the subjective views of the respondent and the particular characteristics of the job.

In most cases, the positions classified as non-technical and non-scientific by the respondents in this survey included business partnerships or self-employment of a non-professional variety, and in some cases supervisory or administrative work. This was especially true of graduates from engineering and business courses in which about 18 per cent classified their employment as non-professional. A high proportion (14 per cent) of the agriculture graduates also replied that a scientific and technical background was not required in their work; many of these were managing their own farms, a type of work which perhaps does not require technical and scientific training but which nevertheless provides an opportunity for such knowledge to be used quite extensively. Of the mining engineering graduates, 13 per cent were engaged in a non-scientific, non-technical capacity involving, in the main, supervisory work.

Table 3 – Employed (Full or Part-Time) 1954 Graduates: Field of Scholastic Specialization in 1954 by Field of Employment Specialization in 1957

FIELD OF SCHOLASTIC SPECIALIZATION	FIELD OF EMPLOYMENT SPECIALIZATION																				
	Total	Aeronautical Engineering	Chemical Engineering and Chemistry	Civil Engineering	Electrical Engineering	Engineering and Business	Engineering Physics	Forest Engineering and Forestry	Geological Engineering and Geology	Metallurgical Engineering	Mechanical Engineering	Mining Engineering	Petroleum Engineering	Architecture	Agriculture	Biochemistry and Physiology	Biology	Geography	Mathematics and Physics	Veterinary Medicine	Non-Scientific and Non-Technical	CHANGE
All Fields	1,438	13	185	220	194	42	5	59	64	23	150	17	70	70	95	3	37	7	59	47	78	–
Aeronautical Engineering	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Chemical Engineering and Chemistry	150	–	**103**	2	1	3	1	–	1	3	5	1	22	–	–	–	1	–	3	–	4	– 47
Civil Engineering	231	2	–	**193**	–	4	1	–	–	–	8	1	14	6	–	–	–	–	–	–	2	– 38
Electrical Engineering	166	3	1	–	**148**	4	–	–	–	–	8	–	2	–	–	–	–	–	–	–	–	– 18
Engineering and Business	27	–	3	1	3	**11**	–	–	–	–	4	1	1	–	–	–	–	–	–	–	3	– 16
Engineering Physics	23	–	1	–	17	–	**2**	–	1	1	1	–	–	–	–	–	–	–	–	–	–	– 21
Forest Engineering and Forestry	71	–	1	7	–	–	–	**59**	1	–	–	–	–	–	–	–	1	–	–	–	2	– 12
Geological Engineering and Geological Sciences	42	–	–	3	–	–	–	–	**31**	–	2	3	1	–	1	–	–	–	–	–	1	– 11
Metallurgical Engineering	21	1	2	–	–	–	–	–	–	**17**	–	–	1	–	–	–	–	–	–	–	–	– 4
Mechanical Engineering	184	6	5	5	5	17	1	–	1	–	**119**	–	10	–	1	–	1	–	1	–	12	– 65
Mining Engineering	21	–	–	–	–	1	–	–	4	–	–	**10**	3	–	–	–	–	–	–	–	3	– 11
Petroleum Engineering	10	–	–	–	–	–	–	–	–	–	–	–	**10**	–	–	–	–	–	–	–	–	–
Architecture	63	–	–	–	–	–	–	–	–	–	–	–	–	**60**	–	–	–	–	–	–	3	– 3
Agriculture	140	–	14	1	2	–	–	–	–	–	–	–	2	2	**88**	–	4	–	3	–	24	– 52
Biochemistry and Physiology	5	–	3	–	–	–	–	–	–	–	–	–	–	–	–	**2**	–	–	–	–	–	– 3
Biology	16	–	–	–	–	–	–	–	1	–	–	–	–	–	–	1	**13**	–	–	–	1	– 3
General Science	173	1	51	8	11	2	–	–	21	2	2	1	4	2	5	–	17	1	27	–	18	–173
Geography	8	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	**6**	–	–	1	– 2
Mathematics and Physics	39	–	1	–	7	–	–	–	2	–	1	–	–	–	–	–	–	–	**25**	–	3	– 14
Veterinary Medicine	48	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**47**	1	– 1
NET CHANGE		+13	+35	–11	+28	+15	–18	–12	+42	+2	–34	–3	+60	+7	–45	–2	+21	–1	+20		Total 78	

One-half per cent of the graduates, mostly young women, had entered the labour force but had left it some time prior to 1957, in most cases due to marriage.

A small proportion (1.1 per cent) were doing part-time work consisting, principally, of lecturing and academic research usually in conjunction with post-graduate training.

CHANGES IN SPECIALIZATION. . .

Did any of the graduates work in a different field of specialization in 1957 than the one for which their university course specifically trained them?

Table 3 shows the movement which has taken place between the academic field and the employment field.

From every scholastic field (i.e. the field in which the individuals graduated), with the exception of petroleum engineering, some graduates have moved into a different employment field. In most cases, this movement appears to be into some employment field reasonably similar to the scholastic field from which they graduated, and therefore where their academic training would be of value. Thus, while about half of the mining engineering graduates found employment in some other field, 19 per cent acquired jobs in the closely related field of geological engineering and 14 per cent in petroleum engineering. Similarly, while 20 per cent left metallurgical engineering, half of these found jobs in the related field of chemical engineering and chemistry. Engineers and scientists moved about a good deal *within* their respective categories of engineering and science, but less movement took place *between* those categories.

The only scholastic field which did not relinquish graduates to other fields was petroleum engineering. Furthermore, in 1957, there were seven times as many engaged in petroleum engineering as had graduated from that course in 1954. This represents the greatest proportional increase in any field.

There are no well-founded means of deciding the causes of this shifting among fields and there is certainly no single determinant made clear in **Table 3.** In a few cases, like petroleum engineering and agriculture, there may be some suggestion of an income or demand determinant. But, on the whole, movement does not necessarily gravitate towards high-income fields from low-income fields.* For example, the highest-paid field, mining engineering, lost more than half of its graduates to other fields. Consequently, the salary incentive cannot be accepted with any high degree of confidence as the fundamental cause. In all probability there is no single determinant for the shifting, and these movements are the result of numerous determinants and therefore of individual decisions based on a combination of monetary and non-monetary considerations.

One general conclusion that can be drawn is that many of the various fields of employment specialization are not rigidly defined and permit a considerable degree of overlapping and interchanging.

---

*See Table 12 illustrating salaries.

Table 4 – Employed (Full or Part Time) 1954 Graduates[1]: Field of Specialization in 1957 by Employer in 1957

EMPLOYER	Aeronautical Engineering	Chemical Enginering and Chemistry	Civil Engineering	Electrical Engineering	Engineering and Business	Engineering Physics	Forest Engineering and Forestry	Geological Engineering and Geology	Metallurgical Engineering	Mechanical Engineering	Mining Engineering	Petroleum Engineering	Architecture	Agriculture	Biochemistry and Physiology	Biology	Geography	Mathematics and Physics	Veterinary	Non-Scientific and Non-Technical	Total	Per Cent of Graduate Group
INDUSTRY																						
Primary (including mining)	–	–	1	–	1	–	7	31	1	3	9	9	–	13	–	–	–	8	–	3	78	7.2
Manufacturing	9	147	24	84	32	2	24	21	20	104	7	48	2	26	3	4	–	–	–	28	593	54.9
Construction	–	2	44	4	–	–	–	–	–	4	–	3	4	–	–	–	–	–	–	–	61	5.6
Transportation, Storage, and Communication	3	–	7	30	2	–	–	–	–	3	–	–	3	1	–	–	–	–	–	5	54	5.0
Public Utilities (other than transportation and communication)	–	–	14	33	3	–	–	–	–	11	–	7	2	1	–	–	–	–	–	1	72	6.7
Trade, Finance, Insurance	–	2	2	2	–	–	1	–	–	2	–	–	3	3	–	1	–	6	–	12	34	3.1
Business Service	–	2	56	15	3	1	2	4	1	10	1	–	48	3	–	3	–	1	34	5	189	17.5
Total	12	153	148	168	41	3	34	56	22	137	17	67	62	47	3	8	–	15	34	54	1,081	100.0
Percent of Grand Total	92.3	82.7	67.3	86.6	97.6	60.0	57.6	87.5	95.7	91.3	100.0	95.7	88.6	51.6	100.0	21.6	0.0	26.8	72.3	75.0		75.9
GOVERNMENT																						
Dominion	1	16	13	19	–	1	1	2	1	8	–	1	1	16	–	2	–	14	9	12	117	49.4
Provincial	–	–	24	–	1	–	23	3	–	–	–	1	1	15	–	7	–	2	3	–	80	33.7
Municipal	–	1	21	3	–	–	–	–	–	1	–	1	5	–	–	–	1	1	–	2	36	15.2
Other Government Service	–	–	1	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	1	–	4	1.7
Total	1	17	59	22	1	1	24	5	1	9	–	3	7	33	–	9	1	17	13	14	237	100.0
Per Cent of Grand Total	7.7	9.2	26.8	11.3	2.4	20.0	40.7	7.8	4.3	6.0	0.0	4.3	10.0	36.3	0.0	24.3	14.3	30.4	27.7	19.4		16.6
EDUCATION																						
University	–	6	13	4	–	1	1	2	–	4	–	–	1	6	–	6	1	5	–	–	50	46.7
Secondary School	–	9	–	–	–	–	–	1	–	–	–	–	–	5	–	14	5	19	–	4	57	53.3
Total	–	15	13	4	–	1	1	3	–	4	–	–	1	11	–	20	6	24	–	4	107	100.0
Per Cent of Grand Total	0.0	8.1	5.9	2.1	0.0	20.0	1.7	4.7	0.0	2.7	0.0	0.0	1.4	12.1	0.0	54.1	85.7	42.8	0.0	5.6		7.5
GRAND TOTAL	13	185	220	194	42	5	59	64	23	150	17	70	70	91	3	37	7	56	47	72	1,425	100.0

(1) Excludes 13 persons because of insufficient information (4 in Agriculture, 3 in Mathematics and Physics and 6 in Non-Scientific and Non-Professional occupations).

THE THREE MAJOR EMPLOYERS . . .

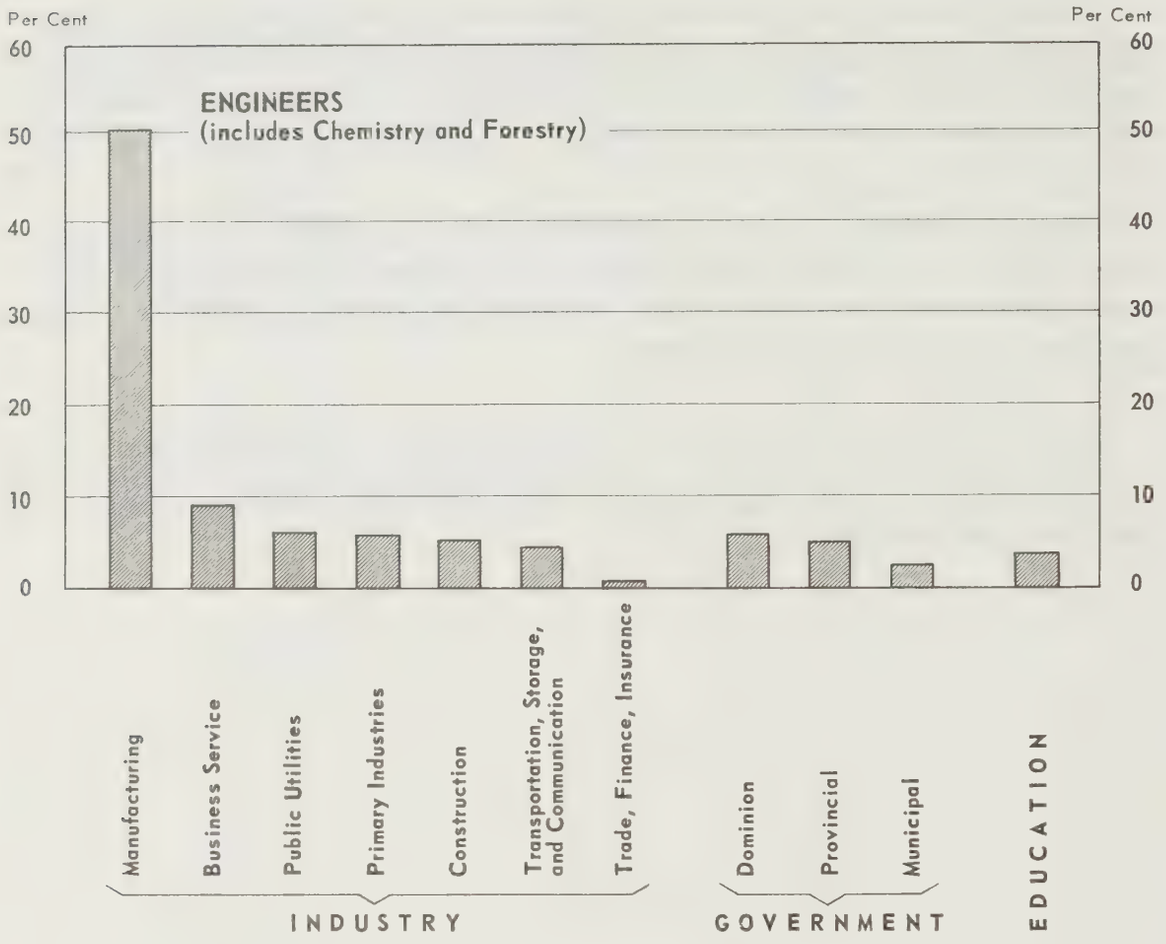
What types of employers have hired the 1954 graduates?

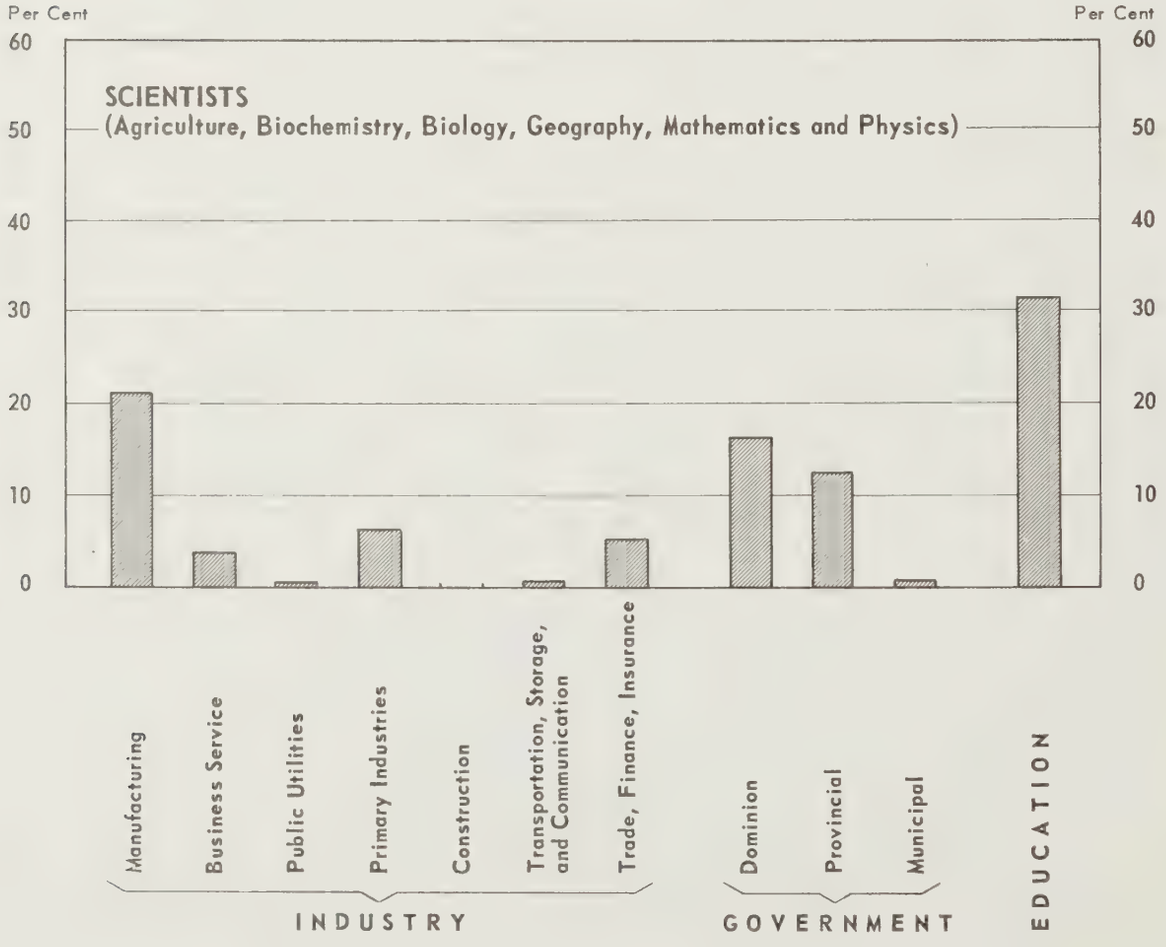
More than 75 per cent of the graduates were employed by industry. approximately 17 per cent by government,* and 8 per cent by educational institutions. The engineers were very heavily concentrated in industry, while the scientists were more evenly distributed throughout the three sectors.

Manufacturing was the major industrial employer, engaging more than half of all industrial employees, the Federal Government hired the most government workers, while universities and high schools shared teachers in about equal numbers.

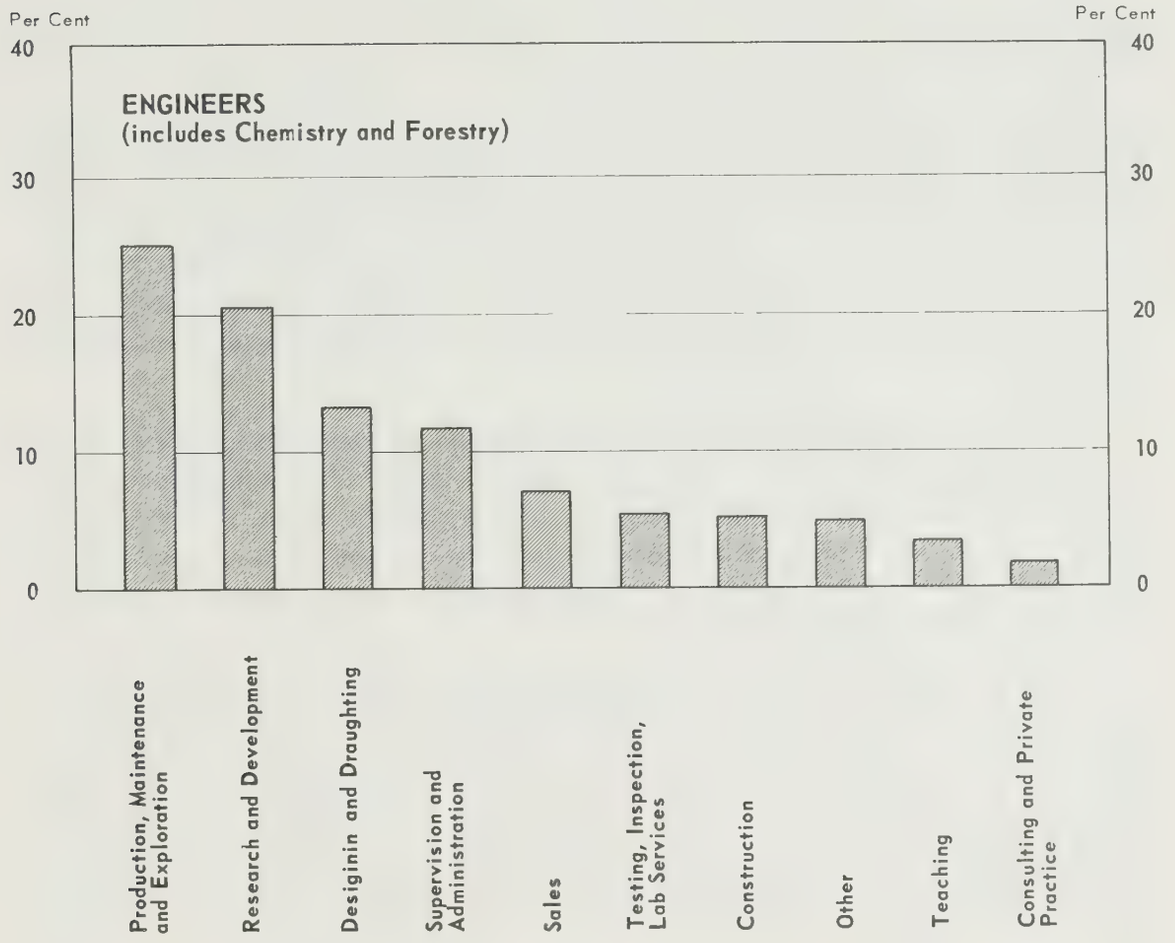
***However, all employees of crown corporations (such as CNR and Atomic Energy of Canada) and crown commissions (such as Ontario Hydro) have been placed in the industrial sector. Had these been included under the government sector, its total would have been somewhat higher.**

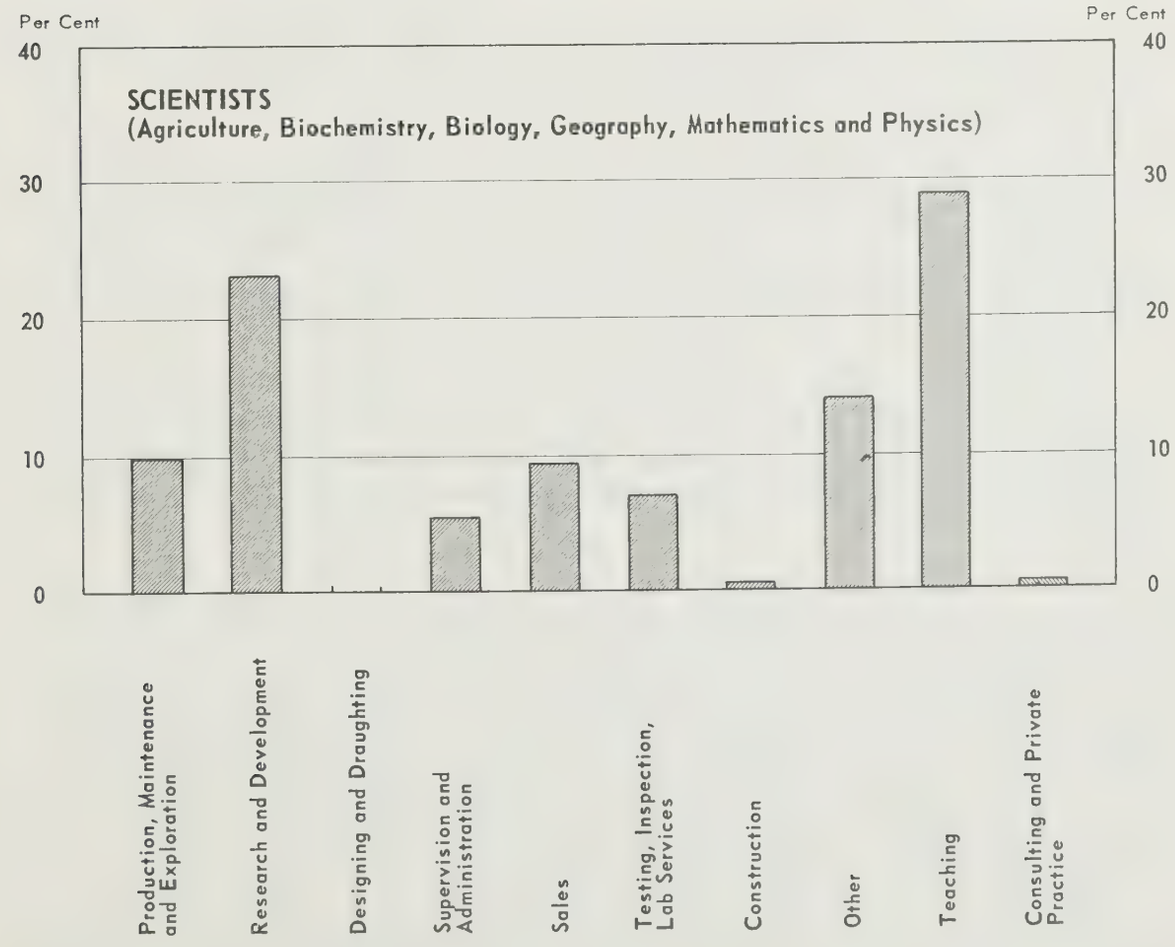
THE TYPES OF EMPLOYERS WITH WHOM THE 1954 ENGINEERING AND SCIENCE GRADUATES WERE WORKING IN 1957





THE FUNCTIONS BEING PERFORMED IN 1957 BY ENGINEERING AND SCIENCE GRADUATES OF 1954





THE WORK PERFORMED . . .

What functions are the graduates performing in their 1957 employment?

As **Table 5** indicates, the largest proportion of the graduates were engaged, in 1957, in production, maintenance and exploration work (20 per cent) and in research and development work (19 per cent). Although only 13 per cent of the graduates were employed as designers, the engineers were very heavily concentrated in designing; the total here is distorted because no scientists went into designing jobs. Three-quarters of those in design were engineers and one-quarter were architects.

Production, maintenance and exploration, research and development, and (for engineers) designing seem to be the functions most commonly assigned to new professionals with little work experience. Other studies indicate that as time passes more engineers move into administration and consulting while teaching, administration and consulting grow in importance for scientists. *

It is difficult to make any generalization as to career patterns in terms of functions performed, as functions seem to vary with educational specialization and the industry into which the engineer or scientist enters to begin his professional career. Possible fruitful research could be done in this field by studies restricted to individual industries to describe and contrast the prevalent patterns of development in different industrial sectors.

It is significant that by 1957 only one-tenth of the 1954 graduates were supervisors or administrators, and most of these did not appear to be holding senior positions.

Almost half of those classified under "Other" were performing non-scientific, non-technical functions. The other half were engaged in financial work such as accounting and budgetary control, in writing, and in personnel and safety. Possibly some of this work also could be considered non-scientific and non-technical.

Teaching was more frequently a type of job held by scientists than by engineers. About 25 per cent of the scientists were teaching in 1957 as opposed to less than 3 per cent of engineers. Considered as a whole, about 7 per cent of the 1954 graduates had moved into teaching positions by 1957.

The smallest proportion (3.8 per cent) were in consulting and private practice. This probably is attributable to the fact that the early post-graduate period under scrutiny here, does not allow sufficient time for the graduates to become established in private practice, and the opportunities for employment with firms of consulting engineers and scientists are limited by the small number and small staff capacity of these firms. Over half of those in consulting and private practice were veterinarians who are traditionally self-employed professionals.

*Economics and Research Branch, Department of Labour: *Engineering and Scientific Manpower Resources in Canada: Their Earnings, Employment and Education 1957. Preliminary Release of Tabulations, November 1958, Tables 9 and 10.*

Table 5 – Employed (Full or Part Time) 1954 Graduates: Field of Specialization in 1957 by Function in 1957

FUNCTION	Aeronautical Engineering	Chemical Engineering and Chemistry	Civil Engineering	Electrical Engineering	Engineering and Business	Engineering Physics	Forest Engineering and Forestry	Geological Engineering and Geology	Metallurgical Engineering	Mechanical Engineering	Mining Engineering	Petroleum Engineering	Architecture	Agriculture	Biochemistry and Physiology	Biology	Geography	Mathematics and Physics	Veterinary Medicine	Non-Scientific and Non-Technical	Total	Per Cent of Graduate Group
Research and Development	2	72	17	48	5	4	6	14	16	17	4	12	4	21	–	14	1	11	6	–	274	19.1
Designing and Draughting	3	7	57	25	6	–	–	–	–	32	1	8	47	–	–	–	–	–	–	–	186	12.9
Testing, Inspection, Laboratory Services	1	21	14	7	–	–	–	1	3	4	–	6	2	9	1	3	–	1	3	–	76	5.2
Production, Maintenance and Exploration (1)	4	25	34	48	12	1	24	38	3	45	6	25	3	13	–	–	–	7	–	–	288	20.0
Construction	–	1	43	6	1	–	–	–	–	3	–	2	4	1	–	–	–	–	–	–	61	4.2
Supervision and Administration	1	17	24	20	13	–	23	2	–	10	4	10	5	4	–	3	–	4	2	–	142	9.9
Teaching	–	13	12	2	–	–	1	4	–	4	–	–	1	15	1	13	6	24	2	–	98	6.8
Sales	1	22	3	19	2	–	–	–	1	24	1	1	–	15	1	–	–	3	–	–	93	6.5
Consulting and Private Practice	–	1	9	2	2	–	1	3	–	3	–	–	3	–	–	1	–	–	29	–	54	3.8
Other (including non-scientific and non-technical) (2)	1	6	7	17	1	–	4	2	–	8	1	6	1	17	–	3	–	9	5	78	166	11.6
Total	13	185	220	194	42	5	59	64	23	150	17	70	70	95	3	37	7	59	47	78	1,438	100.0

(1) Includes also installation, layout and location.

(2) Includes writing, personnel and safety, finance and accounting, and other non-scientific, non-technical functions.

Table 6 – Employed (Full-Time) 1954 Graduates [1] by Number of Jobs, 1954–57

	Total	Per Cent	1 Job	Per Cent	2 Jobs	Per Cent	3 or More Jobs	Per Cent
Engineers [2]	771	100.0	239	30.0	229	30.0	303	40.0
Scientists	392	100.0	153	39.0	112	29.0	127	32.0
Total	1,163	100.0	392	34.0	341	29.0	430	37.0

(1) Excluding those with post-graduate training, those in non-technical and non-scientific occupations and students.
(2) Includes architects.

Table 7 – 1954 Graduates in Technical and Scientific Employment (Excluding Those with Post-Graduate Training and Part-Time Workers): By Number of Functions and Number of Jobs, 1954–1957

	Total	Per Cent	1 Job	Per Cent	2 Jobs, 1 Function	Per Cent	2 Jobs, 2 Functions	Per Cent	3 or More Jobs, 1 Function	Per Cent	3 or More Jobs, 2 Functions	Per Cent	3 or More Jobs, 3 Functions	Per Cent	Incomplete Information	Per Cent
Engineers	771	100	239	31	52	6	163	21	44	6	118	15	135	18	20	3
Scientists	392	100	153	39	39	10	65	17	24	6	47	12	49	12	15	4
Total	1,163	100	392	34	91	8	228	19	68	6	165	14	184	16	35	3

Table 8 – 1954 Graduates [1]: Their Marital Status, by Number of Jobs, 1954–1957

Marital Status	Total	Per Cent	1 Job	Per Cent	2 Jobs	Per Cent	3 or More Jobs	Per Cent
Single 1954–57	376	100	126	33	116	31	134	36
Married 1954	163	100	48	29	49	30	66	41
Became Married 1954–57	621	100	216	35	176	28	229	37
Separated, Widowed or Divorced or Acquired Such Status, 1954–57	3	100	2	(2)	–	–	1	(2)
Total	1,163	100	392	33	341	30	430	37

(1) Excluding those with post-graduate training, those in non-technical and non-scientific occupations, and students.
(2) Base too small to compute percentage values.

WORK EXPERIENCE . . .

How varied has individual work experience been?

This report provides information on work experience in terms of the variety of jobs held and the functions that were performed in different jobs by the graduates during their initial three years in gainful employment. **Table 6** shows that 40 per cent of the engineers held three or more jobs during the period as compared with 32 per cent of the scientists. At the other end of the job mobility scale, 39 per cent of the scientists stayed with their first employer against 30 per cent of the engineers. The percentages of engineers and scientists who held two jobs were 30 per cent and 29 per cent respectively. These results indicate a fairly high degree of job mobility for the group as a whole with the engineers slightly more willing or more able to change from one employer and/or job to another than the scientists.

Table 7 shows the six groups (engineers with one, two, three or more jobs and scientists with one, two, three or more jobs) broken down further by variety of functions performed. It is interesting to note that in both the "two job" and "three or more job" groups a significantly larger proportion of the graduates have performed a variety of functions. Twenty-one per cent of engineers and 17 per cent of scientists performed two functions in two jobs, compared to only 7 per cent and 10 per cent respectively whose functions were the same in both jobs. The same phenomenon is in evidence among the group who held three or more jobs during the three-year period. The percentage values for engineers in order of increasing number of functions are 6, 15, and 18 per cent. The same percentage values for the scientist group are 6, 12 and 12 per cent respectively.

No explanation can be advanced at this point to explain this phenomenon. It may be due to a preference of the employee for a different function at the time he changes jobs or it may reflect the employers' view that experience in one function is prerequisite for the employee to perform a different function satisfactorily. There seems to be evidence that some general hierarchy of functions exists.*

MOBILITY OF SINGLE AND MARRIED GRADUATES . . .

Were the single 1954 graduates more mobile than those who were married?

Table 8 shows the engineers and scientists combined into one group and analyzed according to number of jobs held during the period 1954-1957, and marital status. The main interest of the results is that they show neither significant differences between groups of different marital status nor do they show any large scale deviation from the pattern of distribution shown in **Table 6** where marital status is not taken into account.

**Engineering and Scientific Manpower Resources in Canada, Their Earnings, Employment and Education, 1957. Preliminary Tabulations,* Department of Labour, Ottawa 1958, *Table 9.*

The largest proportion of any marital status group was found to be the most mobile fraction. Thirty six per cent of the group which remained single, 41 per cent of the married category and 37 per cent of those who became married during the period 1954-1957 changed jobs more than twice. Next highest proportion of all groups held one job and the lowest proportion changed jobs once. The highly uniform pattern of groups with different marital status on the one hand and with a varying number of employers on the other hand seems to preclude any significant correlation between the two variables.

Various theoretical explanations could be advanced to account for the unimportance of marital status as a factor in job mobility; none of them, however, could be ascertained or disproved with the information available from this survey.

GEOGRAPHIC MOBILITY . . .

To what extent have the 1954 graduates taken jobs in parts of the country other than those where they lived or were educated?

The geographic mobility of the 1954 graduates is shown in **Tables 9 and 10.** It was necessary to present information in two tables because the university student may be said to have two types of permanent residence: the parent's home, and the geographical location of the university attended, where the better part of the past four or five years was spent. **Table 9** relates home address, job location in 1957, and the number of jobs held during the three-year period under review. **Table 10** relates the number of jobs held, the location of the job in 1957 and the place of study. However, the picture indicated by the two tables is so similar that the only conclusion to be drawn is that a large majority of the students chose and succeeded in entering a university in the province of their permanent residence.

It seems that irrespective of the number of jobs held, there is a reluctance or inability on the part of the graduates to move away from either their home province or from the province in which they studied.

To confirm this, the data were broken down according to location of study, 1954 permanent residence, and 1957 location of job. Out of the group of 771 engineers, 62 per cent were studying in their home province and 38 per cent outside their home province. Out of the group of 392 scientists, 72 per cent were studying in their home province and only 28 per cent outside it. Out of that group of engineers who studied in their home province, only 10 per cent left for work in other parts of Canada. Similarly, out of the 72 per cent of scientists who studied in their home province, about 13 per cent had jobs in 1957 in the rest of the country.

The resistance to geographical relocation does not imply that no movement took place. By 1957 11 per cent of the 1954 engineering and science graduates were living in foreign countries, of which one-half were employed and the other half were pursuing further studies. (Of the 122 members of the graduating class who were not Canadian citizens in 1954, by 1957 only 16 were among those who left the country; 65 had

Table 9 – 1954 Graduates [1]: By Number of Jobs and Geographical Location in 1954 and 1957

	Total	Per Cent	1 Job Home Province	Per Cent	1 Job Different Provinces	Per Cent	2 Jobs Home Province	Per Cent	2 Jobs Different Provinces	Per Cent	3 or More Jobs Home Province	Per Cent	3 or More Jobs Different Provinces	Per Cent
Engineers [2]	771	100	160	21	79	10	143	18	86	11	191	25	112	15
Scientists	392	100	115	30	38	10	79	20	33	8	89	22	38	10
Total	1,163	100	275	24	117	10	222	19	119	10	280	24	150	13

(1) Excluding those with post-graduate training, those in non-technical and non-scientific occupations and students.

(2) Includes architects.

Table 10 – 1954 Graduates [1]: By Number of Jobs, Location of Job 1957 and Place of Study

	Total	Per Cent	1 Job Same Province as Study	Per Cent	1 Job Different Province than Study	Per Cent	2 Jobs Same Province as Study	Per Cent	2 Jobs Different Province than Study	Per Cent	3 Jobs Same Province as Study	Per Cent	3 Jobs Different Province than Study	Per Cent
Engineers [2]	771	100	154	20	85	11	132	17	97	12	181	24	122	16
Scientists	392	100	97	25	56	14	78	20	34	9	80	20	47	12
Total	1,163	100	251	21	141	12	210	18	131	11	261	23	169	15

(1) Excluding those with post-graduate degree, those in non-technical and non-scientific occupations and students.

(2) Includes architects.

Table 11 – 1954 Graduates: Geographical Location in 1954 and 1957, by Scholastic Specialization

LOCATION	Aeronautical Engineering	Chemical Engineering and Chemistry	Civil Engineering	Electrical Engineering	Engineering and Business	Engineering Physics	Forest Engineering and Forestry	Geological Engineering and Geology	Metallurgical Engineering	Mechanical Engineering	Mining Engineering	Petroleum Engineering	Architecture	Agriculture	Biochemistry and Physiology	Biology	General Science	Geography	Mathematics and Physics	Veterinary Medicine	Total	Per Cent
1954																						
CANADA																						
Newfoundland	–	1	7	–	–	–	–	–	–	–	–	–	–	–	–	–	4	–	–	–	12	.7
P.E.I.	–	1	3	1	–	–	–	–	–	–	–	–	–	2	–	–	5	–	–	–	12	.7
Nova Scotia	–	4	10	7	–	–	1	–	2	9	3	–	1	9	–	2	20	–	1	–	69	4.1
New Brunswick	–	8	13	7	–	–	7	1	–	7	1	–	–	1	–	–	6	–	2	–	53	3.1
Quebec	–	27	53	48	–	6	18	10	8	39	5	–	14	17	4	5	77	–	20	9	360	21.6
Ontario	1	91	60	49	26	13	36	17	9	77	11	–	21	58	8	17	33	6	35	27	595	35.8
Manitoba	–	8	18	11	–	1	–	4	–	14	–	–	15	11	–	1	36	–	3	4	126	7.6
Saskatchewan	–	8	17	3	–	1	1	9	–	13	–	–	5	24	–	–	4	–	3	1	89	5.4
Alberta	–	13	24	11	1	–	–	6	–	8	1	–	1	18	–	1	30	–	5	4	132	7.9
British Columbia	–	14	20	19	–	7	13	5	3	15	2	1	7	28	–	3	46	–	6	3	192	11.5
Yukon and N.W.T.	–	–	–	1	–	–	–	–	–	1	–	–	–	1	–	–	–	–	–	–	3	.2
UNITED STATES	–	1	1	1	–	–	1	–	–	1	–	–	–	–	–	–	2	–	1	1	9	.5
UNITED KINGDOM	–	–	1	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	3	.2
OTHER COMMONWEALTH	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	1	–	–	1	4	.3
AFRICA	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ASIA	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MEXICO, C.A., S.A.	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	.1
CONTINENTAL EUROPE	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	.1
Total	1	176	228	161	27	28	77	52	22	184	23	10	64	173	12	29	264	6	76	50	1,663	100.0

1957																						
CANADA																						
Newfoundland	–	–	5	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	6	.4
P.E.I.	–	–	2	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	3	.2
Nova Scotia	–	1	6	5	–	1	1	–	–	5	–	–	–	7	–	1	20	–	1	–	48	2.8
New Brunswick	–	4	7	1	–	–	5	1	–	5	–	–	–	–	–	–	1	–	–	–	24	1.4
Quebec	–	51	59	58	3	6	14	11	8	64	8	–	12	21	4	6	81	1	18	8	433	25.4
Ontario	1	78	73	68	23	10	34	12	11	73	10	–	24	57	11	11	50	6	26	22	600	35.1
Manitoba	–	1	13	5	–	1	–	2	–	8	–	–	10	10	–	1	24	–	1	2	78	4.6
Saskatchewan	–	2	5	–	–	–	1	3	–	4	1	2	4	14	–	1	5	–	1	2	45	2.6
Alberta	–	20	32	4	–	1	2	10	1	11	4	7	2	19	–	–	34	2	2	8	159	9.3
British Columbia	–	5	19	7	–	1	17	3	1	9	–	–	4	18	–	4	32	–	2	2	124	7.3
Yukon and N.W.T.	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	1	–	1	–	4	.2
UNITED STATES	–	15	12	15	1	6	3	8	–	3	–	–	5	22	1	5	10	–	21	4	131	7.7
UNITED KINGDOM	–	4	1	1	1	–	–	–	1	–	–	–	1	2	–	1	2	–	5	1	20	1.2
OTHER COMMONWEALTH	–	–	–	1	–	2	–	–	–	–	–	–	–	4	–	–	1	–	–	–	8	.5
AFRICA	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–
ASIA	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1	–
MEXICO, C.A., S.A.	–	–	1	3	–	–	–	1	–	1	–	1	–	–	–	–	1	–	–	–	8	.5
CONTINENTAL EUROPE	–	–	1	1	–	–	2	–	–	1	–	–	1	1	1	–	2	–	2	1	13	.8
Total	1	181	236	169	28	28	79	52	22	184	23	10	64	179	17	30	264	9	80	50	1,706	100.0

Note: The 1954 figures refer to home addresses, not to addresses while attending university.

The 1957 figures refer mainly to place of employment. The home addresses may not in all cases be the same as employment addresses. For students in 1957 the university addresses are used.

acquired Canadian citizenship and 51 were residing in Canada as non-citizens. In all, about 90 per cent of all graduates have remained in Canada after obtaining their bachelor's degree.)In 1954, about 57 per cent of the graduates were residing* in Ontario and Quebec, 32 per cent in the Prairie provinces and British Columbia and 9 per cent in the Maritime provinces. Approximately 2 per cent lived in the Canadian territories or foreign countries **(Table 11)**. In 1957, 60 per cent were living and working in Ontario and Quebec, 24 per cent in the Prairie provinces and British Columbia and 5 per cent in the Maritime provinces. About 11 per cent were residing in the Canadian territories or foreign countries and almost three-quarters of these were in the United States.**

The geographical distribution of graduates in 1957 conforms quite closely to the geographical pattern of the net product of manufacturing establishments. In 1954, it rather closely followed the distribution of the total population which is to be expected as the home address of the students was taken into account rather than their university location.

	Geographical Distribution of Graduating Class by Home Address, 1954	Distribution of Canadian Population, 1954 (1)
	%	%
Maritime provinces	9.0	11.0
Ontario and Quebec	57.0	62.0
Western provinces	32.0	26.0
Other	2.0	1.0
	100.0	100.0

	Geographical Distribution of 1954 Graduates in 1957	Net Value of Production (2) 1957
	%	%
Maritime provinces	5.0	5.7
Ontario and Quebec	60.0	68.4
Western provinces	24.0	25.6
Other	11.0	0.3
	100.0	100.0

(1) Source: DBS Statistical Review Supplement, 1957, Table 4, pages 7-11.
(2) Source: DBS Canada Year Book 1957/58, Table 4, p. 741.

This reflects the fact that productive capacity is somewhat differently dispersed in the country than is the population, with the result than the graduating class has to make a small overall locational adjustment as they enter the labour market. (See Chapter 1, Sections 6 and 7, on mobility).

The notable exception is the Ontario and Quebec region which seems to have obtained a smaller proportion of the graduates than its share in the net value of production would warrant. This is due to some extent to the fact that approximately 11 per cent of the graduates left Canada either for employment or further study. If no graduate had left the country, the redistribution of the 11 per cent (the graduates that left Canada) according to the existing pattern would bring the geographical dispersion much closer to the pattern of production.

*The 1954 figures refer to the graduates' home addresses, not to their addresses while attending university.

**The 1957 figures refer mainly to place of employment. It is possible that some of the home addresses will not be the same as the employment address. For students in 1957 the university address rather than the home address is used.

MEDIAN SALARIES IN 1957 OF THE 1954 ENGINEERING AND SCIENCE GRADUATES

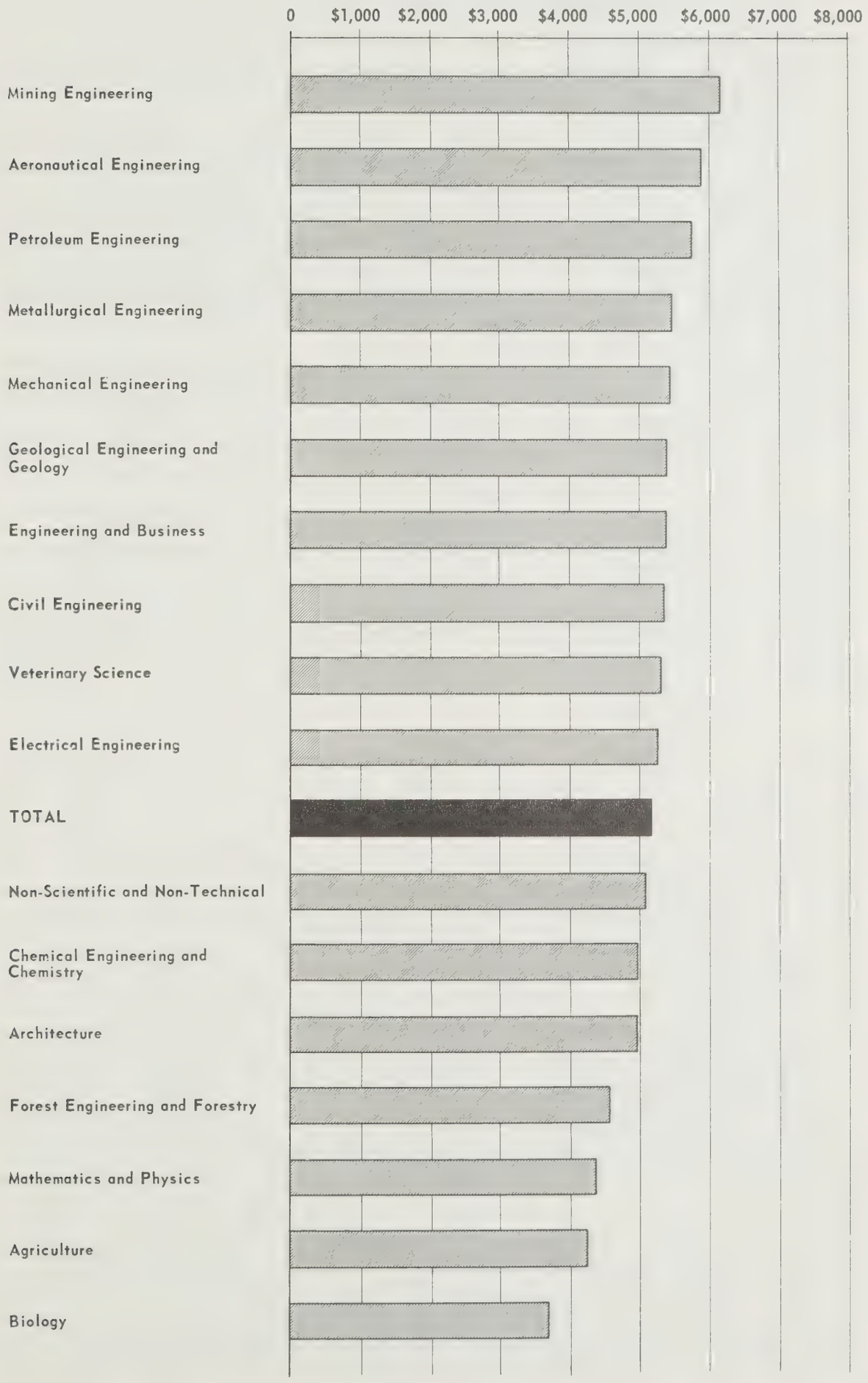


Table 12 – 1954 Graduates Employed Full or Part Time: Salaries Reported in 1957,
By Field of Specialization in 1957

SALARY	Aeronautical Engineering	Chemical Engineering	Civil Engineering	Electrical Engineering	Engineering and Business	Engineering Physics	Forest Engineering and Forestry	Geological Engineering and Geology	Metallurgical Engineering	Mechanical Engineering	Mining Engineering	Petroleum Engineering	Architecture	Agriculture	Biochemistry and Physiology	Biology	Geography	Mathematics and Physics	Veterinary Medicine	Non-Scientific and Non-Technical	Total
Up to $3499	–	9	1	1	1	–	1	1	–	–	–	–	1	15	2	14	3	10	1	6	66
$3500–$3999	–	10	6	6	–	–	11	3	–	1	–	–	7	16	–	7	2	7	2	7	85
$4000–$4499	2	22	19	15	1	1	16	3	1	5	–	2	11	26	–	6	–	10	3	10	153
$4500–$4999	1	43	39	40	9	1	15	8	4	34	4	8	14	16	–	3	1	7	8	11	266
$5000–$5499	2	45	58	55	13	1	11	21	7	38	2	16	19	6	1	–	–	5	13	14	327
$5500–$5999	2	16	31	24	6	1	1	7	5	26	1	18	7	2	–	–	–	3	2	6	158
$6000–$6499	2	14	28	26	7	–	3	6	4	25	4	14	5	–	–	2	–	4	3	5	152
$6500–$6999	2	1	9	4	3	–	1	4	1	5	1	4	–	–	–	–	–	1	2	5	43
$7000 and Over	2	5	14	12	–	–	–	7	–	8	4	7	–	3	–	–	–	–	9	5	76
Total	13	165	205	183	40	4	59	60	22	142	16	69	64	84	3	32	6	47	43	69	1326
Median Salary	$ *5875*	$ *4982*	$ *5323*	$ *5268*	$ *5346*	$ (1)	$ *4550*	$ *5357*	$ *5428*	$ *5407*	$ *6125*	$ *5736*	$ *4964*	$ *4211*	$ (1)	$ *3642*	$ (1)	$ *4325*	$ *5288*	$ *5017*	$ *5142*

(1) Insufficient number to warrant computation of median.

(2) Discrepancies between these totals and those given in other tables are due to insufficient information on returned questionnaires.

Chapter II – REMUNERATION

A COMPARISON OF SALARIES IN VARIOUS FIELDS . . .

What fields of specialization were most remunerative for the 1954 graduates three years after graduation?

With the single exception of veterinary science, engineers, as a group, received higher salaries than scientists in 1957. The leading fields were mining engineering with a median salary of $6,125, aeronautical engineering $5,875, and petroleum engineering $5,736. The aggregate median salary for all the graduates was $5,142 **(Table 12).**

No direct comparison could be made between the graduates' starting salaries in 1954 and their salaries in 1957, because most of the graduates were still attending university when the 1954 questionnaires were completed. However, if we employ the findings of certain other reports, some useful comparison can be made.

For example, the National Employment Service * reported a median starting salary of $3,696 per annum for bachelor graduates in 1954. If calculations are based on this information, the conclusion could be drawn that the 1954 graduates had enjoyed a substantial salary increase (approximately 40 per cent) by 1957. Of course, it must be borne in mind that the sample and methods used are somewhat different in the two reports.

THE MOST REMUNERATIVE FUNCTIONS . . .

What functions have the 1954 graduates found most remunerative?

According to **Table 13** the median salary varied little from function to funtion, except for teachers, whose salary was about $1,000 below the overall median, and testing and laboratory services which also carry with them a significantly lower starting salary. This high degree of uniformity is likely a peculiarity of the short-run period following graduation. For example, the administrative function is usually accompanied by the highest income. But persons in the present survey who held administrative jobs in 1957, having had only three years' working experience, probably are performing only junior administrative functions. As time goes on, it can be expected that salaries will grow further apart with persons in certain functions (especially administration, consulting and private practice) increasing their incomes at faster rates than those in other functions. **

*Minimum monthly starting salaries reported to the National Employment Service by Canadian employers. Unemployment Insurance Commission NES, Executive Professional Section, Spring 1954.

**Engineering and Scientific Manpower Resources in Canada, Their Earnings, Employment and Education, 1957, Preliminary Release of Tabulations, Economics and Research Branch, Department of Labour, Ottawa, November 1958, Tables 4 and 5.

SALARIES IN GOVERNMENT, INDUSTRY AND EDUCATION . . .

Which employer groups pay the highest salaries?

The 1954 graduating class obtained their highest salaries in 1957 from industry (median $5,301), with those employed by governments receiving 12 per cent less than in industry (median $4,676), and those in educational institutions receiving 25 per cent less than in industry (median $3,945).

There was little salary variation from one type of industry to another, the highest being for those in public utilities with a median salary of $5,588 and the lowest being for those in transportation with $4,964.

In government service, those employed by municipalities received the highest median salary ($5,050) and those in the employ of provincial governments the lowest ($4,370).

In education, graduates employed by universities received a median salary of $4,312 while those employed by high schools received $3,722.

SALARIES ACROSS CANADA . . .

Do salaries vary from one geographical region to another?

No significant regional salary differences could be found by comparing one Canadian province to another. The graduates' salaries appear to be determined to a greater extent by other factors such as field of specialization and employer group than by the location of the job.

However, it was discovered that:

(a) higher salaries seemed to be paid in areas far removed from civilization, or outside Canada particularly in South America, probably as a form of compensation for inconvenient working and living conditions.

(b) slightly higher salaries were earned by those working in the United States.

SALARIES RELATED TO FURTHER TRAINING . . .

Did salaries vary according to the level of academic training?

In the short run of three years such as the one examined in this report it seems impossible with any degree of confidence to draw conclusions about variations in salary levels according to academic degree. It normally takes three years of post-graduate study to obtain a doctorate and at least one year to complete requirements for a master degree. The time spent in post-graduate study delays the entrance into the labour market of the graduates working for an advanced degree, relative to the graduates who did not pursue a post-graduate education. An additional distorting factor is the apparent preference of those with post-graduate degrees to enter the lower-paying sectors of the economy

Table 13 – 1954 Graduates Employed Full Time or Part Time: Their Function in 1957, by Salaries Reported in 1957

FUNCTION	Up to $3499	$3500 to $3999	$4000 to $4499	$4500 to $4999	$5000 to $5499	$5500 to $5999	$6000 to $6499	$6500 to $6999	$7000 and over	Total	Median Salary
											$
Research and Development	23	13	27	53	66	19	28	5	10	244	5045
Designing and Draughting	1	6	9	39	55	24	30	2	5	171	5277
Testing, Laboratory Services	5	8	15	18	11	7	6	–	–	70	4694
Production, Maintenance, Exploration, etc.	4	8	23	58	70	48	35	14	13	273	5310
Construction	–	1	6	9	14	10	7	5	4	56	5428
Supervision and Administration	–	10	19	19	30	13	24	2	18	135	5325
Teaching	21	20	24	9	9	4	5	1	1	94	4125
Sales	2	2	9	21	28	10	7	3	9	91	5205
Consulting and Private Practice	2	2	2	6	16	6	7	1	10	52	5437
Other	7	9	16	25	23	10	8	6	11	115	5010
Total [1]	65	79	150	257	322	151	157	39	81	1,301	5154

(1) Discrepancies between these totals and those given in other tables are due to insufficient information on returned questionnaires.

Table 14 – 1954 Graduates (Employed Full Time) who Completed Post-Graduate Training Prior to 1957, by Degree and Employer

	Industry	Per Cent	Govern-ment	Per Cent	Univer-sities	Per Cent	Informa-tion Incomplete	Per Cent	Total
Obtained Master Degree	82	59	27	19	25	18	5	4	139
Obtained Doctorate	4	29	4	29	4	29	2	13	14
Entered Employment without Obtaining Post-graduate Degree	15	62	6	25	3	13	–	–	24
Total	101	57	37	21	32	18	7	4	177

rather than industry. An interesting comparison can be made by contrasting the findings of Chapter I, page 5, with **Table 14**. Governmental departments and universities obtained a considerably higher proportion of graduates with post-graduate degrees (37 per cent) than they did of graduates with bachelor degrees (24 per cent). A combination of these two factors seems to produce the small differential between salary levels of graduates with and without post-graduate degrees and to explain the number of cases where this differential becomes zero or even negative.

SALARIES RELATED TO CHANGE OF JOB

Was there any relationship between degree of employment mobility and salary levels?

Table 15 provides information as to the effect of job mobility on salary levels. An analysis of the data indicates that among engineers frequent change of job was not a factor influencing salary. The highest proportion of all three groups of engineers, (25 per cent of the group with one, 30 per cent of the group with two, and 30 per cent of the group with three or more jobs), all received between $5,000 and $5,500 per annum. At no other salary level have significant advantages accrued to the engineer who was willing to change jobs more frequently.

The situation is somewhat different among the three groups of scientists. Whereas no meaningful difference can be detected between the scientists with one and two jobs during the three years under study, those scientists who changed jobs three times or more definitely seem to be in a more advantageous position. It is significant that 24 per cent of the "three or more jobs" scientists had salaries ranging from $4,500 to $4,999 per annum against only 9 per cent and 12 per cent for the other two groups of scientists where the greatest proportion earned from $4,000 to $4,499 per annum. Again, 11 per cent of the scientists with three or more jobs reached a level of salary between $6,000 to $6,500 per annum against only 3 per cent and 2 per cent of the scientists with one and two jobs respectively.

The information was not detailed enough to provide an explanation for the strong uniformity between the three engineering sub-groups or for the difference between the first two and the third science groups. It would be interesting and useful to obtain more and better information on the different factors affecting mobility and to trace more fully its salary consequences.

ADDITIONAL INCOME

Is any professional income earned in addition to salary?

Of 1,438 graduates employed in 1957, ninety-three (approximately 6 per cent) were receiving professional income in addition to their regular earnings. In few cases did this amount exceed $1,000 per year and usually it was only $200 or $300. There was no indication on the questionnaires of the exact nature of the work. Many of those earning additional income were teachers who took on extra employment during the summer months.

Table 15 – 1954 Graduates[1]: Number of Jobs Held 1954-57, by Salaries Reported in 1957

	Total	Per Cent	Up to $3499	Per Cent	$3500 to $3999	Per Cent	$4000 to $4499	Per Cent	$4500 to $4999	Per Cent	$5000 to $5499	Per Cent	$5500 to $5999	Per Cent	$6000 to $6499	Per Cent	$6500 to $6999	Per Cent	Over $7000	Per Cent
Engineers, 1 Job	239	100	11	5	6	2	16	7	42	18	68	29	45	18	30	13	5	1	16	7
Engineers, 2 Jobs	229	100	16	7	1	–	15	7	54	24	60	26	31	13	37	16	7	3	8	4
Engineers, 3 Jobs	303	100	19	6	5	2	13	4	52	17	91	30	46	15	43	14	14	5	20	7
Scientists, 1 Job	153	100	35	23	22	14	32	20	13	9	25	16	9	6	4	3	4	3	9	6
Scientists, 2 Jobs	112	100	23	20	21	19	23	20	13	12	17	15	8	7	2	2	1	1	4	4
Scientists, 3 Jobs	127	100	24	21	9	7	21	17	30	24	18	13	2	1	15	11	2	1	6	5
Total	1,163	100	128	11	64	5	120	10	204	18	279	24	141	12	131	11	33	3	63	6

(1) Excluding those with post-graduate training, those in non-technical and non-scientific occupations, and students.

Table 16 – 1954 Graduates: Graduate Training Completed by 1957

	Aeronautical Engineering	Chemical Engineering and Chemistry	Civil Engineering	Electrical Engineering	Engineering and Business	Engineering Physics	Forest Engineering and Forestry	Geological Engineering and Geology	Metallurgical Engineering	Mechanical Engineering	Mining Engineering	Petroleum Engineering	Architecture	Agriculture	Biochemistry and Physiology	Biology	General Science	Geography	Mathematics and Physics	Veterinary Medicine	Total
Number of 1954 Graduates	1	181	236	169	28	28	79	52	22	184	23	10	64	179	17	30	264	9	80	50	1,706
Number with Master's Degree by 1957	1	44	23	9	2	8	2	14	4	5	3	–	4	37	4	18	25	2	48	–	253
Percentage with Master's Degree by 1957	–	24.3	9.7	5.3	7.1	28.6	2.5	26.9	18.1	2.7	13.0	–	6.2	20.7	23.5	60.0	9.5	22.2	60.0	–	14.8
Number with Doctorate by 1957	–	9	–	1	–	1	1	2	–	–	–	–	1	3	3	2	3	–	5	1	32
Percentage with Doctorate by 1957	–	5.0	–	.6	–	3.6	1.3	3.8	–	–	–	–	1.6	1.7	17.6	6.7	1.1	–	6.2	2.0	1.9
Number in Post-Graduate Study but not yet with Post-Graduate Degree	–	6	5	4	1	3	7	3	1	–	1	–	–	10	7	1	63	–	5	1	118
Per Cent in Post-Graduate Study but not yet with Post-Graduate Degree	–	3.3	2.1	2.4	3.6	10.7	8.9	5.8	4.5	–	4.3	–	–	5.6	41.1	3.3	23.9	–	6.3	2.0	6.9

Chapter III – POST-GRADUATE STUDY

VARIATIONS BETWEEN ENGINEERS AND SCIENTISTS . . .

What academic levels have the graduates reached? Is the pursuit of post-graduate study more pronounced in some fields than in others?

All of the individuals considered in this report received a bachelor's degree in 1954. **Table 16** indicates those who have proceeded to post-graduate studies. Approximately 15 per cent obtained a master's degree by 1957, 2 per cent a doctorate, and 7 per cent were still studying for but had not yet received a post-graduate degree.

Post-graduate study was found to be more pronounced among scientists than among engineers. Two tentative reasons can be advanced for this phenomenon. First, an engineering degree confers on the person receiving it full professional status by virtue of the strict curriculum regulations, whereas in most science courses (honour or general) the bachelor degree is merely a semi-professional qualification due to the relative freedom of the individual to pursue courses of his and or her choosing, and full professional credit is not accorded till the first post-graduate degree is reached. Presumably this situation exerts much more pressure on scientists to undertake post-graduate training than on engineers.

A second factor lies in the personality of the student. The student who has an interest in research and study is more apt to choose the science course than engineering and will proceed to a post-graduate degree which is almost a necessary condition in the field of the graduate's interest. On the other hand, the student who is more interested in applying science to productive processes will choose the corresponding engineering field and on obtaining his bachelor degree will not proceed to further formal training in the chosen field since he already possesses the necessary professional skills and status to enter the labour market.

Table 16 does show certain engineering fields with a fairly high porportion of post-graduate degrees, but these are either engineering fields which, for the purpose of this report, have been combined with the corresponding science field (e.g. chemical engineering and chemistry, geological engineering and geological sciences) in which case the scientists are chiefly responsible for the high proportion of post-graduates, or else they are fields like engineering, physics and metallurgical engineering which have many of the characteristics of the scientific fields.

Post-graduate study was most popular in mathematics and physics where a total of 72 per cent were in possession or pursuit of post-graduate degrees, closely followed by biology with 70 per cent. Petroleum engineering, mechanical engineering, and veterinary science all showed less than 5 per cent in post-graduate studies or with post-graduate degrees.

INDIVIDUAL VARIATIONS . . .

How varied has individual educational training been?

In all but a very insignificant number of cases, only one bachelor's course in a scientific or technical field has been received by the 1954 graduates. In post-graduate studies, the same field of specialization was continued by the great majority, while others chose a field of study very closely related to that of the bachelor degree.

However, some of the graduates acquired a second degree in some non-scientific or non-technical line of work. Many graduates of Quebec universities held a bachelor of arts degree from a French-Canadian classical college. Some were studying law and others (especially biochemistry and physiology graduates) took up medicine.

An interesting fact was that only about 50 of the graduates, or less than 3 per cent (principally engineers), had obtained degrees or diplomas in business administration or commerce, reflecting presumably a desire to rise to top supervisory or administrative levels in industry.

It may be appropriate to restate that all studies of this type are limited by a possible "no response" bias. It is conceivable that the non-respondents to the survey constitute a group whose characteristics and/or behavior are different from those of the respondents on which the foregoing analysis has been based. The rate of response in this case (71½ per cent) could be termed better than average for a mail survey, but nevertheless it should be kept in mind that the results may have this limitation.